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Socialist Economic Growth and Political Investment Cycles

Heng-fu Zou

Investment rates in China have often been highest under leftist (hardline) political regimes, not rightist (softline) political regimes.

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This paper — a product of the Public Economics Division, Country Economics Department — is part of a larger effort in PRE to study the centrally planned economies in transition. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Ann Bhalla, room N10-059, extension 37699 (24 pages).

Socialist economic growth in China and Eastern Europe has long been characterized by investment hunger, drives toward expansion, and cyclical fluctuation of investment rates.

For decades, relatively high grow rates — often accompanied by a shortage of consumption goods — have typically been achieved at the consumers' expense.

Treating social planners as self-interested bureaucrats, Zou offers a positive model to help understand the norms of socialist economic growth. This model demonstrates:

- How rapid capital accumulation tends to serve the social planners' own interests.
- Why investment hunger is an inevitable consequence of social planners' rational choices.
- When a drive toward expansion can cause a permanent shortage of consumption goods.

Through numerical examples and empirical tests, Zou provides a framework within which to analyze political investment cycles in a socialist economy. In China, Zou finds that high investment rates have often been linked to leftist (or hardline) political regimes and low or moderate investment rates with "rightist" (or softline) political regimes.

Socialist Economic Growth and Political Investment Cycles

By

Heng-fu Zou

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I. Introduction

In traditional optimal growth models for a centrally planned economy, e. g. Cass (1965) and Koopmans (1965), social planners maximize an intertemporal social welfare function defined on per capita consumption, subject to the dynamic constraint of capital accumulation. The results from these models have become the folklore of modern economics: there exists a unique optimum path converging asymptotically to the unique equilibrium; the optimum capital stock in long-run is determined by the famous modified golden rule, i.e., marginal productivity of capital is equal to the natural growth rate of population plus the time discount rate of social planners. In these models, social planners all act in the interest of the society. They do not have any objective function other than the welfare of the people, and their personal images are only reflected in the time discount rate. Cass (1965) provides a typical picture of the central planners: "The central planning authority's concept of social welfare is related to the ability of the economy to provide consumption goods over time. In particular, welfare at any point of time is measured by a

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utility index of current consumption per capita .... The central planning authority recognizes that consumption tomorrow is not the same thing as consumption today. For this reason, it takes the politically pragmatic view that its planning obligation is stronger to present and near future generations than to far removed future generations. This view is implemented in practice by discounting future welfare at a positive rate".

This approach to socialist growth suffers from serious limitations when compared to socialist reality. First of all, traditional optimal growth models are based on an insufficient understanding or indeed, a misunderstanding of the nature of the social planners. This point has been emphasized by Janos Kornai in his various studies (Kornai, 1982, 1986, 1988). With both political power and economic resources in their control, social planners are not constrained or directed to choose the optimum feasible growth path with respect to the only criterion, which is to maximize social welfare. "Such an unworldly bureaucracy never existed in the past and will never exist in the future. Political bureaucracies have inner conflicts reflecting the divisions of society and the diverse pressures of various social groups. They pursue their own individual and group interests, including the interests of the particular specialized agency to which they belong. Power creates an irresistable temptation to make use of it. A bureaucrat must be interventionist because that is his role in the society; it is dictated by his situation" (Kornai 1986, pp. 1726-27). In practice, social planners are often investment growth rate maximizers (Grosfeld, 1987), and their personal interests are more connected to the persistent expansion of their organizations than to the increase in people's consumption. In their investment trategies, "the highest priority is placed on industry, and within industry on heavy industry, and within heavy industry on the part related to

the military. ... Among the neglected, non-priority sectors, one typically finds agriculture, and even more so all the branches of the tertiary or service sector, such as transport and telecommunication, housing, other communal services, domestic trade, and health. This diversion of resources from consumption to investment takes place not provisionally for two or three years, but for decades, for twenty, thirty, or forty years". (Kornai, 1988, p.244).

In this paper, we intend to offer a simple alternative model to capture certain essential aspects of socialist economic growth. The most important feature of the model is in defining the social planners' objective function in both per capita consumption and *per capita capital stock*. The model is justified and set up in Section II. In its abstract form, this modelling was presented by Mordecai Kurz in 1968. That paper has long been neglected in the economics profession partly because, we guess, Kurz has not offered any justification for the so-called wealth effects model. In this paper, we are able to find a realistic setting for the Kurz model in socialist economic growth.

In Section III, we demonstrate that this simple model provides good framework for the understanding of "investment hunger" and "expansion-drive" studied by Kornai (1980). Section IV derives a theory of political investment cycle from our basic model. It is shown that the investment rates (or accumulation rates in the terminology of socialist economics) are related to different political regimes in socialist countries. In Section V, we will look at the empirical data on investment rates from 1952 to 1985 in China. The variations on investment rates throughout those years can be substantially explained by the change of political power at the top level of government, evidence supporting

the theory of the political investment cycle.

II. The Model and Its Justification

We define the instantaneous utility function of social planners at a given time t as the summation of two parts: $u(c_t) + \pi v(k_t)$. c_t is consumption per capita and k_t is capital stock per capita at time t. Social planners derive positive utility from both consumption enjoyed by the people and capital stock owned by the state, so the first order derivatives of functions u(.) and v(.) are positive. The Greek letter π is a positive constant that measures the importance of capital accumulation from the point of view of the social planners. In later sections, we will allow π to take different values, and its effects on capital accumulation, the investment rate and consumption will be studied. Furthermore, for technical reason, we assume that the second order derivatives of u(.) and v(.) are negative, and that:

$$\lim_{c_t \to 0} u'(c_t) = \infty$$

which guarantee the sufficiency of the first order conditions for optimization, and exclude the corner solution of zero consumption.

In modelling the social planners' preference, we maintain that social planners do care about people's consumption, and the improvement in the living standard of the people seems to justify their manipulation of political power and economic resources in a socialist economy. But it is more important to note that social planners' own interest lies more directly in the expansion of the firm and public organization of which they are in charge. Social planners are not just a group of persons in the central planning bureau, they consist of all persons involved in formulating the plan, from the managers at the bottom

to the ministers at the top. According to Janos Kornai (1981, 1986, 1988), the first and the most important motivation for accelerated capital accumulation is the identification of social planners with their own jobs. An expansion of the firm or organization under their direct control is always a source of satisfaction. The second motivation is prestige. "A larger organization brings more prestige, and also more power" (Kornai, 1981). "The simple urge to exert power over people, and to exercise some discretion over the allocation of physical resources can also make managers strive for higher investment levels for their firm" (Kornai, 1988, p.264). So "it is important to note that investment hunger and expansion drive characterize not only the behavior of the top manager and his subordinates in a particular firm, but also *the attitude of economic agents at all levels of the bureaucratic hierarchy in a socialist system.... the general ideology of the system favors expansion, and no claimant's application for funds is ever regarded as unreasonable or unethical by anyone in the hierarchy. On the contrary, everyone considers such a request as the natural and normal behavior within the system.*" (Kornai, 1988, pp.264-265, italic added.)

This assessment of socialist planners is essentially the same as the one used in the analysis of bureaucrats in western democracies. For example, Orzechowski (1977) defines the bureaucrat's utility function directly on the output produced by his bureau and the capital stock or labor in his control. And the striving for more budget revenue in western public sectors resembles the investment hunger and expansion drive in socialist economies.

With these discussions, we might call π which appeared in the social planners' utility function as the measure of the degree of expansion drive. A large value of π means that the social planners are highly expansion oriented; and a

zero value of π brings us back to Ramsay-Cass-Koopman's mathematical utopia of socialism. (Phelps (1961) presents the golden rule of capital accumulation in "a fable for growthmen". In reality, where we can f'nd the King of the Kingdom of Solovia?)

To proceed with our model, we assume that the social planners maximize the following intertemporal utility with discounting (for notation convenience, we omit the time subscript t of all variables from now on):

$$\int_0^\infty [u(c) + \pi v(k)]e^{-\rho t}dt \qquad \rho > 0 . \qquad (1)$$

where ρ is the social planners' subjective rate of discount.

There is a standard neoclassical production function f(k) in the economy with $f'(k) > 0$, and $f''(k) < 0$. Capital is subject to a depreciation rate δ. The population growth rate is exogenously given as n. So capital accumulation in per capita term follows the dynamic equation:

$$\dot{k} = f(k) - c - (n + \delta)k \qquad (2)$$

Social planners maximize (1) subject to the dynamic constraint (2). The current value Hamiltonian H is defined by:

$$H = u(c) + \pi v(k) + \lambda[f(k) - c - (n + \delta)k] \qquad (3)$$

The optimal paths for consumption and investment are:

$$\dot{c} = \frac{1}{-u''(c)} [\pi v'(k) + u'(c)(f'(k) - n - \delta - \rho)] \qquad (4)$$

$$\dot{k} = f(k) - c - (n + \delta)k \qquad (5)$$

$$\lim_{t\to\infty} e^{-\rho t}\lambda k = 0 \qquad (6)$$

We are going to make a detailed analysis of above dynamics in the next section.

III. The Dynamics of the Model and the Properties of the Equilibrium

As noted by Kurz (1968), the dynamic systems (4) and (5) may easily result in multiple equilibria, and some equilibrium points are saddle point stable, while some are totally unstable. To see this, denote the equilibrium values of consumption and capital as c^* and k^*, and linearize the systems around these values:

$$\begin{bmatrix} \dot{c} \\ \dot{k} \end{bmatrix} = \begin{bmatrix} (n+\delta+\rho) - f'(k^*) & \dfrac{\pi v''(k^*) + u'(c^*)f''(k^*)}{-u''(c^*)} \\ -1 & f'(k^*) - n - \delta \end{bmatrix} \begin{bmatrix} c - c^* \\ k - k^* \end{bmatrix} \qquad (7)$$

Denote the 2x2 matrix as M. The trace of the matrix:

$$\text{Trace of } M = \rho > 0 \ . \qquad (8)$$

As the trace is the sum of the two characteristic roots of the systems, at least one of the roots is positive. Therefore we cannot have a stable equilibrium point.

Next the determinant of the matrix is:

$$\Delta = [n+\delta+\rho-f'(k^*)][f'(k^*)-n-\delta] - \frac{\pi v''(k^*)+u'(c^*)f''(k^*)}{u''(c^*)} \qquad (9)$$

The second term on the right hand side of (9) is negative; the first term is positive or negative depending on whether the capital stock is smaller or larger than the golden rule capital as pointed out by Kurz (1968). If the steady state capital stock is equal to or larger than the golden rule capital, $f'(k)$ is equal to or less than $n + \delta$; the first term on the right hand side of (9) is also negative because $[n+\delta+\rho-f'(k^*)]$ is positive as shown below in proposition one. In this case, Δ is negative. For Δ is the product of two characteristic roots, negative Δ implies that one root is positive and one negative. If Δ is positive, then both roots will be positive as the existence of two negative roots contradicts (8). For this section, we will focus on the case that Δ is negative, that is to say, there exists a unique optimal path in the neighborhood of the equilibrium. Furthermore, we assume that there exists only one equilibrium for the systems. A numerical example is presented in the next section before we go on to discuss the political investment cycle. Of course, if the time discount rate is very small, the first term on the right hand side of (9) is negative; so is Δ.

The properties of the unique saddle point equilibrium follow in order:

Property One: The equilibrium capital stock is larger than the modified golden rule one.

To show this, note that, in a steady state, we have:

$$\frac{1}{-u''(c^*)}\{\pi v'(k^*) + u'(c^*)[f'(k^*) - n-\delta-\rho]\} = 0 \qquad (10)$$

$$f(k^*) - c^* - (n + \delta)k^* = 0 \qquad (11)$$

From (10):

$$f'(k^*) = n + \delta + \rho - \frac{\pi v'(k^*)}{u'(c^*)} < n + \delta + \rho = f'(k^{mg}) \qquad (12)$$

where k^{mg} denotes the modified golden rule amount of capital. From (12), it is clear that $k^* > k^{mg}$ as $f''(.)$ is negative. The explanation is simple. Since social planners benefit directly from the expansion of the economic organizations and since the welfare of consumers over the infinite horizon is not the only criterion for planning, the short-run consumption will be partly sacrified for the expansion drive. It is quite possible that, as shown in next numerical example, consumption is permanently sacrificed in this kind of models: equilibrium consumption is lower than the golden rule one and capital is over-accumulated.

Property Two: The higher the value of π, the higher the steady state capital. Totally differentiating equations (10) and (11), we have:

$$\begin{bmatrix} dc \\ dk \end{bmatrix} = M \begin{bmatrix} \frac{v'(k^*)}{u''(c^*)} d\pi \\ 0 \end{bmatrix} \qquad (13)$$

It is simple to show that:

$$\frac{dk}{d\pi} = \frac{1}{\Delta} \frac{v'(k^*)}{u''(c^*)} \qquad (14)$$

which is positive as the economy is on the unique optimal convergent path. As for the steady state consumption, the sign is ambiguous depending on whether the equilibrium capital is higher or lower than the golden rule capital.

The effects of π on investment and consumption on the unique optimal path can

also be analyzed. From (7), the solutions of the linearized systems for the behavior of the capital stock and consumption are:

$$k_t = k^* - (k^* - k_0)e^{\theta t} \tag{15}$$

$$\dot{k}_t = -\theta(k^* - k_t) \tag{16}$$

$$c_t = c^* + (f'(k^*) - n - \delta - \theta)(k_t - k^*) \tag{17}$$

where θ is the negative root of the dynamic system:

$$\theta = \frac{1}{2}\left[\rho - \sqrt{\rho^2 - 4\Delta}\right] \tag{18}$$

From (16) and (17), it is clear that, through its positive effect on steady state capital, k^*, the high value of π leads to high investment and low consumption on the optimal path for all k_t less than k^*. But we should note that π may also affect θ and c^*. If the increase in π tends to lower θ, in other words, θ becomes more negative, then the investment will be unambiguously high as a result of π being high.

Property Three: The higher the value of π, the higher the steady state investment rate (or saving rate).

In the steady state, investment is just $(n + \delta)k^*$. Let the investment rate (or saving rate) be s, then:

$$s = \frac{(n+\delta)k^*}{f(k^*)} \tag{19}$$

$$\frac{ds}{d\pi} = \frac{(n+\delta)}{(f(k^*))^2}\left[f(k^*) - f'(k^*)k^*\right]\frac{dk}{d\pi} \tag{20}$$

which is positive since $dk/d\pi$ is positive and $[f(k^*)-f'(k^*)k^*]$ is also positive for any concave function.

The three properties stated above reveal how social planners' preferences affect the growth pattern in socialist economies. In the Cass model, we know that the form of social welfare functions does not enter into the determination of equilibrium capital stock. Even if we interpret the social welfare function as the social planners' own preference, the equilibrium capital and consumption are still independent of the social planners' preference as long as their preference is defined only on consumption. Recall from Cass (1965), that in equilibrium:

$$f'(k^{mg}) = n + \delta + \rho \qquad (21)$$

$$f(k^{mg}) - c - (n + \delta)k^{mg} = 0 \qquad (22)$$

so the social welfare function itself plays no role in the determination of k^{mg} in Cass model. (Please compare (21) and (22) with equilibrium conditions (10) and (11).) The invention by Kurz (1968) provides us a rich picture for the link between preference and economic growth. Of course, as a positive approach, the Kurz model with proper justification is much more realistic than the Cass model when applied to a socialist economy.

IV. A Numerical Example and an Illustration of Political Investment Cycle

Even though the modified Kurz model gives us interesting results, the existence of multiple equilibria brings about complicated dynamics even with simple preferences and technology. Here we show that, if preference is the popular logarithm functions of consumption and capital and if technology is

standard Cobb-Douglas, there exists a unique equilibrium and a unique optimal path.

Now the social planners maximize:

$$\int_0^\infty [\log c + \pi \log k] e^{-\rho t} dt \tag{23}$$

s.t.

$$\dot{k} = k^\alpha - c - nk \tag{24}$$

where $0 < \alpha < 1$, and we have set δ equal to zero for simplicity. The corresponding optimal conditions are:

$$\dot{c} = \frac{c}{k} [\pi c - \alpha k^\alpha - (n+\rho)k] \tag{25}$$

$$\dot{k} = k^\alpha - nk - c \tag{26}$$

Set the time derivatives of c and k equal to zero in (25) and (26), the unique optimal equilibrium point is:

$$k^* = \left[\frac{\pi + \alpha}{n\pi+n+\rho}\right]^{\frac{1}{1-\alpha}} \tag{27}$$

$$c^* = k^{*\alpha} - nk^* \tag{28}$$

The determinant of the corresponding matrix M is:

$$\Delta = \frac{c^*}{k^*} \{\pi[\alpha k^{*\alpha-1} - n] + [\alpha^2 k^{*\alpha-1} - (n+\rho)]\} \tag{29}$$

Upon substitution:

$$\Delta = \frac{(n+\rho-n\alpha)(\pi n+n+\rho)[\pi(\alpha-1)-\alpha(1-\alpha)]}{(\pi+\alpha)^2} < 0 \tag{30}$$

is $0 < \alpha < 1$. So there is one negative characteristic root and one positive root: the equilibrium is saddle point stable.

It is straightforward to check that

$$\frac{dk}{d\pi} = (1-\alpha)k^{*\alpha} \frac{\rho+(1-\alpha)n}{(\pi n+n+\rho)^2} > 0 \qquad (31)$$

$$\frac{ds}{d\pi} = n(1-\alpha)k^{*(-\alpha)} \frac{dk}{d\pi} > 0 \qquad (32)$$

Next we are going to see under which circumstances a high degree of expansion drive leads to dynamic inefficiency. In Phelps (1961), the golden rule capital stock at which consumption is maximized is given as (for Cobb-Douglass technology):

$$k^g = \left[\frac{\alpha}{n} \right]^{\frac{1}{1-\alpha}} \qquad (33)$$

For k^* is larger than k^g, it is required that:

$$\frac{\pi + \alpha}{n\pi + n + \rho} > \frac{\alpha}{n} \qquad (34)$$

which is the same as require that:

$$\pi > \frac{\alpha\rho}{1 - \alpha n} \qquad (35)$$

For $\alpha = 0.25$, $\rho = 0.05$, and $n = 0.01$, π should be larger than 0.0125. which is not a strict requirement. So, in this case, the people's consumption is not only sacrificed on the dynamic path converging to the steady state, but is also sacrificed in the steady state.

Suppose there are two groups of social planners in the economy. Following the convention, we may call one group "softliners" or the "right", and other group "hardliners" or the "left". They alternatively control the process of making the plan. It is known that in socialist countries such as Hungary, shifts of resources towards consumption rather than investment always come about as a result of "softline" rule; the "hardliners" or the "left" are always more expansion oriented. (see Kornai, 1988, pp. 283-284). In our model, if we denote π_l as the expansion desire of the "left" and π_r as the expansion desire of the "right" and let $\pi_l > \pi_r > \alpha\rho/(1-\alpha n)$, then the "left" maximizes:

$$\int_0^\infty [\log c_l + \pi_l \log k_l] e^{-\rho t} dt \qquad (36)$$

s.t.

$$k_l = k_l^\alpha - c_l - nk_l \qquad (24)$$

the "right" maximizes:

$$\int_0^\infty [\log c_r + \pi_r \log k_r] e^{-\rho t} dt \qquad (37)$$

s.t.

$$k_r = k_r^\alpha - c_r - nk_r \qquad (24)$$

The initial capital stock is the same for both groups: $k_0 = \bar{k}$. To avoid the problem of time inconsistency, we assume that the "left" and the "right" both commit to the optimal programs they calculate at time zero, and make no changes later on.

From the calculations above, it is easy to obtain that in steady state

$$k_l^* > k_r^*, \quad c_l^* < c_r^* \qquad (38)$$

From (32), the steady state investment rate for the "left' is always larger than the one for the "right". If the "left" is in power, the economy

experiences higher investment and lower consumption; if the "right" is in power, consumption is relatively high and investment relatively lower. The cyclical change in consumption, investment and the investment rate is shown diagramatically below:

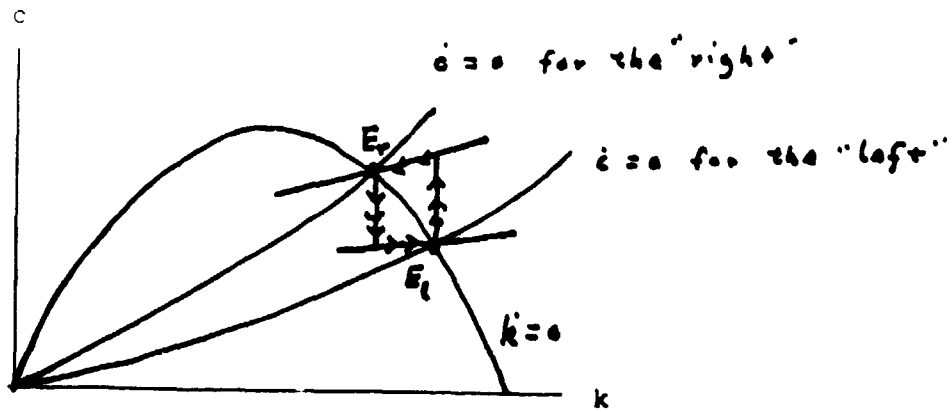

Figure I

where E_l and E_r are equilibrium points for the "left" and the "right" respectively. If the economy is currently in E_l, the power shift from the "left" to the "right" results in an immmediate upward jump in consumption and in a reduction of investment; the new long-run equilibrium is E_r where capital stock is lower than, but consumption is higher than, the equilibrium levels at E_l. The investment rates fluctuate following the political power shifts. This is a demonstration of political investment cycles at steady states. Investment cycles can also happen on the paths converging to the steady states. In Figure II, P_r and P_l are the optimal convergent pathes for the "right" and the "left" respectively.

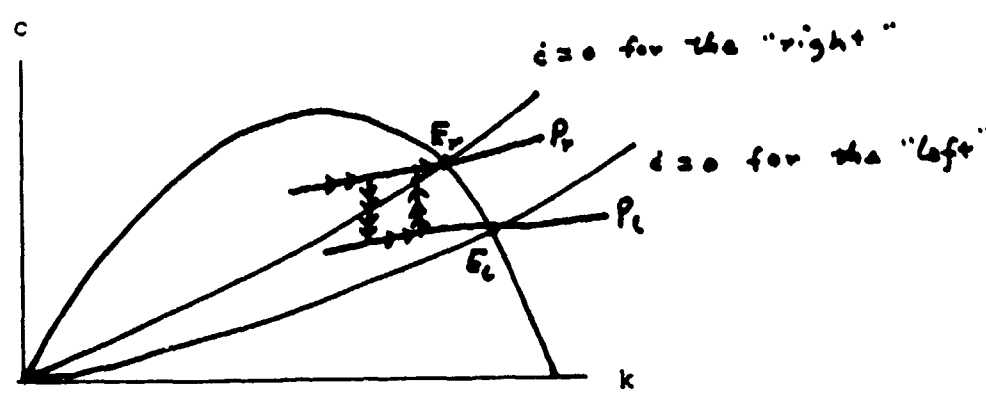

Figure II

If the economy is initially on the path for the "right" P_r, a change in political regime from the "right" to the "left" leads to an immediate downward jump from the path P_r to the path P_l. Throughout time, the economy follows a zigzag path, and investment rates fluctuate accordingly on the path.

V. Historical Evidence

In this section, we present a preliminary empirical study of the effects of political change on the investment rate in China. The labels for different wings of the communist party, the "right" and the "left", are well known in China. The "left" consists of strong, dogmatic adherents of socialism; they advocate the centralization of economic activities, the rapid abolishment of private ownership in the industrial sector, and the rapid transition of the agricultural sector from private ownership to collective ownership and then to state ownership. Chairman Mao is the symbol of the "left". Those on the"right" are more often associated with economic policies with a capitalist flavor, such as relying on market mechanisms and material incentives in the planned sectors and allowing private plots and contract systems in agricutural production. The prominent members of this group are Liu Shaoqi and Deng Xiaoping. They were known as the capitalist representatives in the communist party during the Cultural Revolution. The power struggles between the "left" and the "right" have shaped the history of China in the past four decades, and their effects can be seen in every aspect of Chinese society. Our present focus is on the effects of these struggles on the investment rates.

The following table contains relevent data for our analysis.

year	investment rate as % of GNP	consumption rate as % of GNP	productive investment as % of total investment	power regimes as a dummy variable
1952	21.4	78.6	50.8	0
1953	23.1	76.9	49.4	0
1954	25.5	74.5	50.3	0
1955	22.9	77.1	51.4	0
1956	24.4	75.6	71.0	0
1957	24.9	75.1	58.8	0
1958	33.9	66.1	82.3	1
1959	43.8	56.2	86.9	1
1960	39.6	60.4	97.4	1
1961	19.2	80.8	78.5	0
1962	10.4	89.6	63.6	0
1963	17.5	82.5	63.9	0
1964	22.2	77.8	60.8	0
1965	27.1	72.9	70.7	0
1966	30.6	69.4	68.9	1
1967	21.3	78.7	82.2	1
1968	21.1	78.9	78.5	1
1969	23.2	76.8	76.2	1
1970	32.9	67.1	71.8	1
1971	34.1	65.9	76.2	1
1972	31.6	68.4	78.7	1
1973	32.9	67.1	73.7	1
1974	32.3	67.7	75.4	1
1975	33.9	66.1	73.4	1
1976	30.9	69.1	79.3	1
1977	32.3	67.7	70.9	1
1978	36.5	63.5	71.8	1
1979	34.6	65.4	64.1	0
1980	31.5	68.5	54.5	0
1981	28.3	71.7	46.8	0
1982	28.8	71.2	46.4	0
1983	29.7	70.3	52.5	0
1984	31.2	68.8	58.6	0
1985	33.7	66.3	57.7	0

Source.---Statistical Year Book of China, 1986

In the table, the power over economic planning is represented by a dummy variable; a value of zero means that the "right" controls the planning board, while a value of one means that the "left" controls the planning. The term "productive investment" is special to Marxist and socialist economics, and needs some explanation. It refers to investment that directly serves material production or meets the needs of material production. Its counterpart is

non-productive investment, which includes investment on public utilities, housing, public health, social welfare and education. Since non-productive investment is more or less related to people's consumption, especially durable and public consumption, the percentage of productive investment in total investment outlay is a more accurate measure of accumulation. The fluctuations in investment rate and the productive investment rate are depicted in Figure III below.

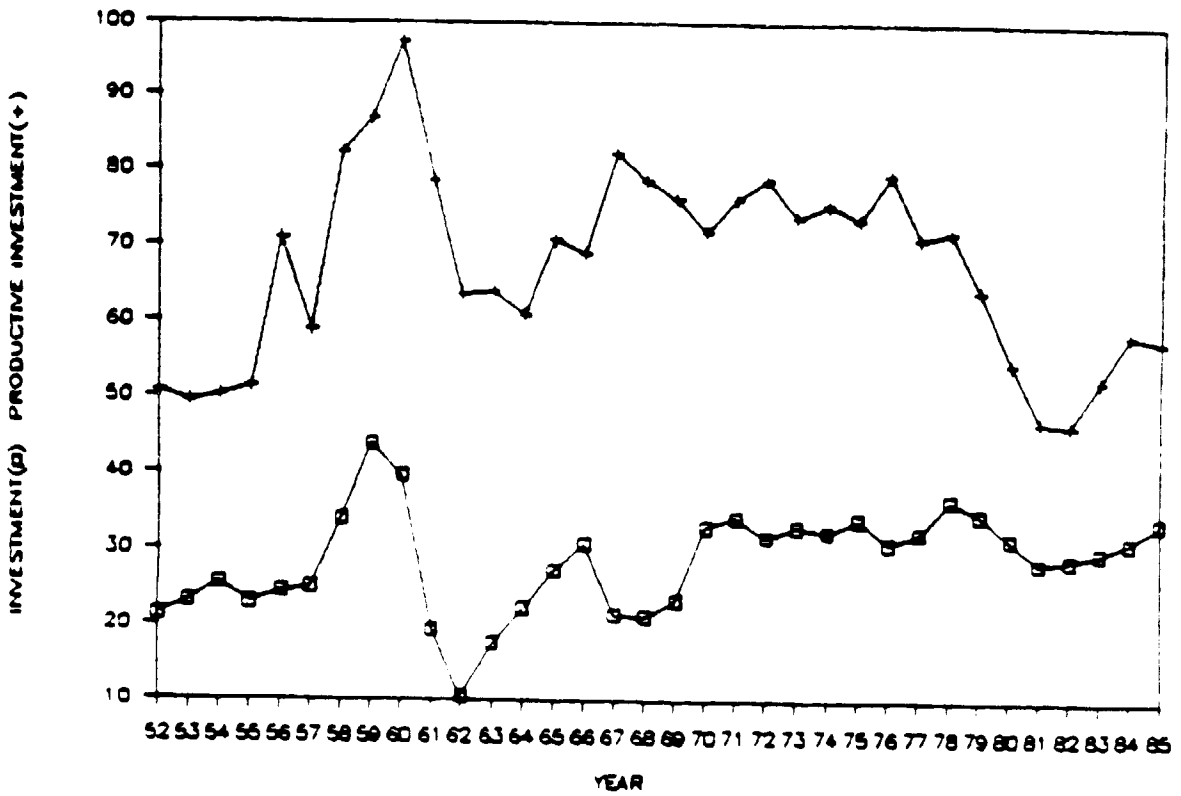

Figure III

During the period 1952-57, economic decision-makings was more under the control of the "right" as Mao did not totally dominate the planning processes and political life was more democratic in the communist party than it subsequently became. The investment rates were in the range of 21.4 percent and 25.5 percent. The average share of productive investment in total investment was 55.3%. Both production and consumption went up rapidly in those six years, and those investment rates were later regarded as the optimal or

normal ones.

The year 1957 was a turning point in the political climate of China. The anti-"rightist" movement launched by Mao had a fundamental effect on the political and economic life of China. With the beginning of the "Great Leap Forward" in 1958 and of the movement of people's communes some time later, economic planning was dominated by the ideology of the "left". The investment rate jumped up to 33.9 percent, 43.8 percent and 39.6 percent in 1958, 1959 and 1960 respectively. The average share of the productive investment for those three years was up to 88.3 percent. High investment rates and natural calamities during this period caused poverty, hunger and death all over China. Facing economic disaster, Mao retreated from economic planning and even admitted to having made a mistake in 1962. The power over planning shifted back into the hands of the "right", and the Chinese economy entered a period of adjustments.

From 1963 to 1965, the average investment rate was set at 22.7 percent and productive investment only accounted for 64 percent of total investment. President Liu Shaoqi even introduced many programs in agricultural production which later under Deng Xiaoping became important ingredients of economic reforms.

The reign of the "right" was short-lived. The next ten years, 1966-76, were those of the "Great Cultural Revolution", and Mao and the "left" were in absolute control of economic planning. Except for the years 1967-69 when the economy was almost paralyzed by destructive political turmoil, the investment rate on the average was above 31 percent, and 75 percent of which was for productive purposes. After Mao's death, his chosen successor, Hua Guofang,

continued the expansion drive of the "left", and even started a "Foreign Leap Forward" from 1977 to 1979, importing large amounts of foreign technology. The average investment rate was above 34 percent.

In 1979, political power began to shift back to the "right", and Deng Xiaoping and the "reformers" came to the forefront, though the ideology of the "left" still deeply affected planning and the effects of the "Foreign Leap Forward" still kept the investment rate at a high level of 34.6 percent. But in that year, the proportion of productive investment in total investment began to decrease. From 1981 to 1985, the average investment rate went down to 30.8 percent, and the average share of productive investment was at a historical low - 52.4 percent. That is to say, a large proportion of investment was diverted to the improvement of residential conditions, service sectors, public health and education.

So we can see that the investment rates and political changes are closely related in China. It is convenient to test how much fluctuations in investment rates and productive investment rates can be explained by the political changes in China's socialist history. Here we report results of a few regression equations:

$$\underset{}{I_t} = \underset{(2.84)}{11.23} + \underset{(2.05)}{4.08}D_t + \underset{(3.36)}{0.55}I_{t-1} \qquad (39)$$

$$R^2 = 0.50, \quad DW = 1.13$$

$$\underset{}{PI_t} = \underset{(4.47)}{31.25} + \underset{(5.17)}{12.36}D_t + \underset{(4.35)}{0.45}PI_{t-1} \qquad (40)$$

$$R^2 = 0.73, \quad DW = 1.93$$

where I_t= investment rate at time t, D_t = dummy variable of political change (a value of one refers to the "left" regime and a value of zero the "right"

regime), and PI_t= share of productive investment in total investment.

Equations (39) and (40) both show that political changes have substantial effects on the investment rate and the productive investment rate. The positive coefficients say that a "left" regime causes high rates, and a "right" regime leads to low rates. As investment projects often last for a few years, the lagged variables also help to explain the rates.

If we exclude the politically abnormal years 1967-69, then political changes alone can explain about half of the variations in the investment rates:

$$I_t = \underset{(18.17)}{25.36} + \underset{(5.19)}{8.9D_t} \qquad (41)$$

$$R^2 = 0.43, \qquad DW = 0.74$$

$$PI_t = \underset{(28.14)}{58.32} + \underset{(6.51)}{19.12D_t} \qquad (42)$$

$$R^2 = 0.57 \qquad DW = 0.93$$

Two points should be added to our analysis of political investment cycles in China. First, the "right" and the "left" are both expansionists by definition because they are both social planners, the difference being only a matter of degree. Throughout time, there is a tendency for social planners to increase the investment rates; this can be seen from regressing the investment rates against a time variable:

$$I_t = \underset{(1.02)}{5.07} + \underset{(2.21)}{4.22D_t} + \underset{(2.56)}{0.48I_{t-1}} + \underset{(1.135)}{0.114TIME} \qquad (43)$$

$$R^2 = 0.52 \qquad DW = 1.13$$

Second, political factors as an exogenous variable cannot fully explain all fluctuations in investment rates; a theory espoused by T. Bauer (1978) and Janos Kornai (1980, 1988), which we may call as model of endogenous investment cycles, has developed to explain investment cycles under the same political regime. The focus of this theory is to relate the investment rate to the intensity of shortage in the economy. Social planners will reduce the investment rate when shortage intensity is high, and raise the investment rate when shortage intensity is low. For a model developed in this line, see Zou (1990). These two theories of investment cycles should be taken as complementary, and "they can be usefully and effectively placed side by side and, taken together, they do a good job not only of explaining the regular pattern of the cycle, but also of explaining its irregularities" (Kornai, 1988, P.284).

VI. SUMMARY

In this paper, we have offered a positive growth model that sheds considerable light on the "norms" of socialist growth, such as investment hunger, expansion drive, chronic shortage and investment cycles. This model also provides an analytical framework within which to study the relationship between investment fluctuations and political changes in socialist countries. Preliminary empirical work on China has provided strong support for this approach.

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